

Financial Vulnerabilities Heatmap

Abstract

This methodological framework examines the use of heat maps as a tool for visualizing large volumes of data through color coding and identifying vulnerabilities in the financial system. The color-coded vulnerability levels should not be interpreted in absolute terms; rather, they should be assessed relative to the historical benchmarks of the selected indicators and used as early-warning signals of the accumulation of systemic risks. The objective of this article is to improve the systematic framework for monitoring and analysing vulnerabilities and risks in the financial system.

Keywords: CoVaR, banking system, function, quantile, profitability, regression, risk.

Financial Vulnerabilities Heatmap

The financial system's vulnerabilities are made clear through a heatmap¹ that uses colors to represent large amounts of data. When colors change from green to red, it indicates an intensification of vulnerabilities. The heatmap's simplicity and ease of understanding make it convenient for analyzing financial system vulnerabilities regularly and assisting in the timely implementation of macroprudential policy measures.

It's important to note that the colors indicating vulnerability levels should not be interpreted in an absolute sense. Instead, they should be compared to historical benchmarks of the selected indicator to signal the build-up of systemic vulnerabilities.

This monitoring tool for financial system risks was developed using the methodology of Arbatli and Johansen (2017). First, to construct a financial vulnerabilities heatmap, a specific period for indicators is selected. Then, the set of indicators is standardized using the following empirical cumulative distribution function:

$$z_t = F_N(x_t) = \begin{cases} \frac{r}{N}, & \text{for } x^r \leq x_t < x^{r+1}, r = 1, 2, \dots, N-1 \\ 1, & \text{for } x_t \geq x^N \end{cases}$$

Where:

x^N is the highest level of the indicator in a given sample.

x^1 is the lowest level of the indicator.

z_t is a standardized indicator.

r is a ranking number assigned to a particular realization of x_t .

N is the total number of observations.

Each indicator's minimum and maximum limits are in the range of (0,1]. Standardized indicators are then displayed as colors, with the gradation from green to red representing an increase in financial vulnerabilities.

¹ Arbatli, E., & Johansen, R. (2017). A Heat Map for Monitoring Systemic Risk in Norway. Norges Bank staff memo 10.